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New taphonomic data of the 1 Myr hominin butchery at Untermassfeld (Thuringia, Germany)

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ABSTRACT

Untermassfeld has provided a butchered bone assemblage and a Mode 1 lithic record demonstrating hominin presence at a site which was classically viewed as paleontological. This archaeological record was found during fieldwork and surveying in fluvial river banks and low-to-medium energy channel erosion sediments. Paleomagnetism and biostratigraphy has yielded an age for this hominin occupation close to the onset of the Jaramillo subchron (ca. 1.07 Myr). In this paper we present new taphonomic data of the cut-marked and hammer-related bone material, corresponding mainly to large-sized herd species (i.e., *Bison*), but also from cervids (*Eucladoceros giulii* and *Cervus s.l. nestii valloinetensis*) and megafaunal species (i.e., *Stephanorhinus hundsheimensis* and *Hippopotamus amphibius antiquus*). Distribution of skeletal elements and bone surface features suggests that this bone assemblage consists of animal remains with different taphonomic origins. The assemblage formed during at most two or three sediment-laden floods, transporting both lithic tools and remains of animals that died of natural causes or were killed by predators. The new taphonomic results presented here are important to analyze hominin colonization and adaptation to European mid-latitude environments at 1 Myr, in competition for meat resources with large carnivores (i.e., *Pachycrocuta brevirostris* and *Panthera onca gombaszoegensis*).

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1. Introduction

Hominin-carnivore interaction in the Early Pleistocene is the focus of a key debate regarding the first peopling of Europe. The nature and causes of this early colonization has been considered from different points of views: the time period of their first arrival (Roebroeks and van Kolfschoten, 1995; Dennell and Roebroeks, 1996; Muttoni et al., 2013; Parés et al., 2013; Garcia et al., 2014), the routes used by hominins to reach the continent (Alimen, 1975; Arribas and Palmqvist, 1998, 1999; Rook et al., 2004; Rolland, 2013; Gibert et al., 2016), and the influence of the climate and the environmental conditions (Agustí et al., 2009, 2010; Blain et al., 2009; Leroy et al., 2011; Rodríguez et al., 2011). All these classic approaches have been reinterpreted in the last decade considering the continuity and/or discontinuity of these occupations during the Early Pleistocene and early Middle Pleistocene (Bar-Yosef and

Cohen, 2001; Roebroeks, 2001; Dennell, 2003; de Lumley et al., 2009; Garcia et al., 2011; MacDonald et al., 2012; Bermúdez de Castro et al., 2013; Rodríguez-Gómez et al., 2014). This debate is now one of the key questions regarding the study of early hominin dispersals to Europe, which is centred mainly on the density of hominin population settlements in Europe during the Early Pleistocene, taking into account the increasing archaeological record available.

Another key research point in the study of the first Europeans is the heated debate among scholars about hominins' place in the trophic chain with respect to large carnivores. Some authors argue that such large carnivores as *Pachycrocuta brevirostris* or *Panthera gombaszoegensis* acted as the main predators in the late Early Pleistocene in Europe. This hypothesis is in accordance with a scenario where hominins were pushed to a secondary role as scavengers (Turner, 1992, 1995; Arribas and Palmqvist, 1999; Martínez-Navarro, 2010; Madurell-Malapeira et al., 2015; Vinuesa et al., 2016). However, zooarchaeological and taphonomic data available at Early Pleistocene European sites increasingly support a primary access of hominins to their prey. This contra-hypothesis argues that hominins gained access to the carcasses before the

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large carnivores did, thus enjoying primary access to the flesh and marrow (Huguet, 2007; Martínez et al., 2010; Blasco et al., 2011; Rodríguez et al., 2011; Saladié et al., 2011, 2014; Huguet et al., 2013, 2015; Patrocínio Espigares et al., 2013; Garcia Garriga et al., 2016; Landeck and Garcia Garriga, 2016). In this paper, new key data defending this 'primary access hypothesis' to mammal carcasses by hominins at ca. 1.07 Myr is based upon taphonomic analysis of the faunal assemblage butchered at Untermassfeld.

This site is considered the oldest evidence of hominin presence in European mid-latitudes (Landeck, 2010; Garcia et al., 2013; Landeck and Garcia Garriga, 2016). At continental low-latitudes, the first evidences of hominin occupation can be traced back to 1.4 Myr at the Spanish sites of Barranco León and Fuente Nueva 3 (Oms et al., 2000, 2011; Agustí and Madurell, 2003; Toro-Moyano et al., 2011, 2013) and possibly at the coeval site of Pirro Nord in Italy (Arzarello et al., 2009, 2012). Similarly, a minimal age of 1.3–1.2 Myr has been claimed for the archaeological finds at Lézignan-la-Cèbe in France (Crochet et al., 2009; Bourguignon et al., 2016). They are chronologically followed by Sima del Elefante in Spain at around 1.2 Myr (Carbonell et al., 2008; de Lombard-Hermida et al., 2015) and Untermassfeld itself at ca. 1.07 Myr (Landeck, 2010; Garcia et al., 2013; Landeck and Garcia Garriga, 2016). Other sites with pre-Jaramillo ages in eastern Europe are Kozarnika cave in Bulgaria, Kocabaş in Turkey, and Bogatyri/Rodniki and Kermek in southern Russia, which may antedate 1.1 Myr (Shchelinsky et al., 2010, 2016; Sirakov et al., 2010; Vialet et al., 2014; Lebatard et al., 2014a, b). Sites of similar age in western Europe are represented by Pont de Lavaud and Lunery-Rosières in the Loire valley in France (Despriée et al., 2011). Slightly younger are the Jaramillo-aged archaeological finds of Vallonnet cave in France and Gran Dolina TD3–4 and TD5, and Vallparadís EVT7 in Spain, which are dated between 1 and 0.9 Myr (de Lumley et al., 1988a, 2009; Echassoux, 2004; Martínez et al., 2010, 2014; Garcia et al., 2014; Duval et al., 2011, 2015; Moreno et al., 2015). Korolevo in Ukraine (Adamenko and Gladilin, 1989; Koulakovska et al., 2010; Stepanchuk et al., 2010; Nawrocki et al., 2016) and Dursunlu in Turkey (Gülec et al., 2009) postdate Jaramillo and predate the Matuyama/Brunhes (M/B) boundary.

After these discoveries, the 'short chronology' hypothesis seemed to be still valid in European mid-latitudes (Roebroeks, 2001; Baales, 2014). However, further archaeological late Early Pleistocene finds in Europe represented by Happisburgh 3 in Great Britain and Dorn-Dürkheim 3 in Germany, which together with Gran Dolina TD6 are closer to the M/B boundary (0.8 Myr), also invalidate the new reformulation of the 'short chronology' hypothesis (Franzen, 1999; Parés and Pérez-González, 1999; Fiedler and Franzen, 2002; Parfitt et al., 2010; Cuenca-Bescós et al., 2015; Moreno et al., 2015). The site of Pakefield in Great Britain, dated to 0.7 Myr, documents along with the post-M/B boundary sites of Vallparadís EVT6/2 (Parfitt et al., 2005; Martínez et al., 2010, 2013) the possible continuity of the occupation of Europe from the late Early Pleistocene up to the M/B boundary (Garcia et al., 2011, 2014). This scenario would be in accordance with the hypothesis defended by Bosinski (2006), which suggested that the first hominin occupation was the result of increasing control of the environment. Similarly, Martínez et al. (2010) and Garcia et al. (2011, 2014), have suggested that early hominins survived during the Early Pleistocene in Europe due to their technological and predator behaviour, and social capabilities. However, it should be borne in mind that this scarce archaeological record displays a very low density of occupation in the European Early Pleistocene compared with subsequent periods.

Although Early Pleistocene sites are much scarcer than in more recent periods, the available data are not in accordance with the hypothesis that during the Early Pleistocene the continent was

under-populated by hominins or even deserted (Gamble, 1995; Dennell and Roebroeks, 1996; Aguirre and Carbonell, 2001; Bar-Yosef and Cohen, 2001; Roebroeks, 2001; Dennell, 2003; Carbonell et al., 2005; Moncel, 2010; MacDonald et al., 2012). It also contradicts the assumed inability of hominins to colonize land north of 50° N (Dennell and Roebroeks, 1996; Roebroeks, 2001; Dennell, 2003; Baales, 2014), or the recent hypothesis defending that hominins first arrived in Europe in a chronologically constrained period of time from 0.85 to 0.78 Myr (Muttoni et al., 2013, 2015). Neither is it in accordance with hypotheses suggesting discontinuity of early hominin occupation based on the climate changes occurring in the Pleistocene according to quantification and simulation climatic models. Taking into account the palynological and climatic data, Leroy et al. (2011) have proposed that there were several possible narrow windows of opportunity for hominins to disperse into Europe during the entire Early Pleistocene, coinciding with particular ecological conditions within glacial and interglacial cycles. One of these climate quantification models is the 'Climatic Amplitude Method', which suggests that the Early Pleistocene interglacials were a few degrees warmer than at present and similar to the Pliocene (Fauquette et al., 1998). In order to obtain more complete climatic contextual data for the study of the first hominin arrival, another model is the 'Mutual Climatic Range method', which has reconstructed a temperature range of 10–13 °C and precipitation range of 800–1000 mm/year. This model employed the study of reptiles and amphibian assemblages, while obtaining similar conclusions regarding the instability of hominin settlement (Agustí et al., 2009).

One of the key issues in early colonization of northern Europe concerns the subsistence behaviour of these first pioneers to withstand environmental constraints of new climatic zones. A sufficient food supply would play a central role in surviving in European mid-latitudes. Solving the question how these early hominins adapted to northern habitats depends substantially on the diagnosis of site function (i.e., kill site, ambush site, or residential camp site). Site location, deciphering of on-site activity, and analysis of butchery traces on bone skeletal-part profiles can help to infer the mode of carcass procurement (i.e., time of access or hunting *versus* scavenging), the pattern of transport strategy used by early Pleistocene hominins, and explain significant off-site or on-site transport of body parts (Blumenschine, 1986; Bunn, 1982, 1986; Potts, 1982, 1983, 1984; Bunn and Kroll, 1986; Bunn and Ezzo, 1993). Before systematic ethnoarchaeological observations of subsistence behaviour of living hunter-gatherer groups in the 1970s, it was widely assumed that foraging early hominins mostly transported the lighter and more nutritious portions of a carcass away from its death site. Thus, different skeletal part distributions at archaeological sites were used to distinguish camp sites, where carcasses were processed, from kill or butchery sites (Lartet and Christy, 1865–75; White, 1952; Perkins and Daly, 1968; Klein, 1976; Bunn, 1986; Bunn and Kroll, 1986, 1988). This behaviour was popularized as the 'schlepp effect' by Perkins and Daly (1968), but its rigid application to archaeological fauna is not reflected in carcass processing and transport decisions by modern humans in ethnoarchaeological contexts (e.g. Yellen, 1977; Binford, 1978; Bunn et al., 1988; O'Connell et al., 1988, 1990).

It has been shown that different factors like carcass size, transport distances between kill and camp site, number of carriers, inferences from carnivores, weather, time of day, and personal preference can modify the number and composition of skeletal parts transported off-site from kill locations. Therefore, the long-standing guiding principle of transportation of body parts that provide the best nutritional yield in meat and marrow from a kill or butchery site to central places and the abandonment of axial skeletal parts at the former sites, has been challenged to provide an

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